

Kalamazoo River Ecological Risk Studies

**Ecological Risk Assessment
Peer Review
Charge to the Peer Review Panel**

May 2008

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1. Background

On February 21, 2007 Georgia-Pacific Corporation and Millennium Holdings, LLC—collectively referred to as the Kalamazoo River Study Group, or KRSG—voluntarily entered into an Administrative Settlement Agreement and Order on Consent (AOC) (Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA] Docket No. V-W-07-C-864) with the U.S. Environmental Protection Agency (USEPA) for the Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site (Site or Superfund Site), located in Kalamazoo and Allegan counties in southwest Michigan. The AOC describes a series of activities associated with supplemental remedial investigations and feasibility studies (SRIs/FSs) that will be carried out over the next several years to address potential risks associated with polychlorinated biphenyls (PCBs) in seven defined Areas of the Kalamazoo River, including a stretch of Portage Creek from Alcott Street to its confluence with the Kalamazoo River. One of these activities is the completion of the Area-Specific Ecological Risk Assessment process for each of the seven defined Areas.

In 2003, Camp, Dresser & McKee (CDM) produced the *Final (Revised) Baseline Ecological Risk Assessment – Allied Paper, Inc./Portage Creek/Kalamazoo River Superfund Site* (Baseline ERA; CDM 2003) on behalf of the Michigan Department of Environmental Quality (MDEQ). CDM's work has been approved by MDEQ and USEPA. Table 1 presents a summary of the terrestrial receptors evaluated in the Baseline ERA and the associated conclusions (CDM 2003).

Table 1 Summary of Conclusions of Baseline ERA by Receptor Group

Receptor Group	Representative Species	Conclusion
Omnivorous Mammals	White-Footed Mouse and Deer Mouse	Unlikely to be at significant risk
Carnivorous Mammals	Red Fox	Unlikely to be at significant risk
Carnivorous Birds	Great-Horned Owl	May be at significant risk depending on diet ¹
Omnivorous/Vermivorous Birds	Robin	Moderate but significant risk

Note:

1. The conclusion for carnivorous birds (great-horned owls) was considered uncertain because of inconsistencies in estimates of risk based on modeled exposure, which indicated low risk, and measured concentrations of PCBs in owl eggs, which indicated high risk.

An initial Baseline Ecological Risk Assessment, prepared on behalf of the Michigan Department of Environmental Quality (MDEQ), was released in June of 1999 (CDM 1999). Subsequent to the release of that document, KRSG provided a series of grants to Michigan State University (MSU) for researchers there to conduct additional ecological studies (the MSU

studies). The MSU studies were not completed until after the Baseline ERA (CDM 2003) was released.

The KRSG has requested that data from the MSU studies be considered as additional lines of evidence for evaluation of ecological risks in the Area-Specific Ecological Risk Assessments and for subsequent risk management decisions. Information regarding the MSU studies has been provided to USEPA and MDEQ for review and consideration. However, since USEPA and MDEQ were not involved in the design or implementation of these studies, the Statement of Work (SOW; included as Attachment A to the AOC) calls for the MSU studies pertaining to floodplain soils to be subjected to a peer review process designed to assess their quality and utility as additional lines of evidence for evaluating potential ecological risk at the Site and informing risk management decisions. The specific charge developed to guide the peer review process is presented in Section 3 of this document.

Both the Baseline ERA (CDM 2003) and the MSU studies included assessments of submerged sediment-based pathways, but the focus of this peer review is specific to the terrestrial receptors whose potential risk is derived from the exposed sediments in formerly impounded areas of the Site. Portions of the floodplains in these areas contain sediments impacted by PCBs that were exposed when water levels in the impoundments were lowered. In this document and other documents related to this peer review, the term “floodplain” is used to refer to the areas of formerly impounded sediments (e.g., the extent of inundation prior to the lowering of water levels in the impoundments), and is not necessarily consistent with specific hydrological or zoning definitions of floodplain. The peer review is focused on these exposed sediments because KRSG and USEPA have agreed that exposures associated with the sediment-based ecological food web are unlikely to be the primary risk drivers for that medium. The peer review panel will receive the Baseline ERA (CDM 2003) for important background information, but will not conduct a peer review of that document.

Depending on the results of the peer review process, the information generated from the MSU studies will be evaluated, along with the information presented in the Baseline ERA (CDM 2003) and other relevant information, as independent lines of evidence in a weight of evidence approach to support the Area-Specific baseline assessments of ecological risks associated with exposure to floodplain soils within formerly impounded areas along the Kalamazoo River. The weighting of each line of evidence will incorporate a variety of technical considerations, including Site-specificity and relevance to assessment endpoints (e.g., protecting the sustainability of local populations). Preliminary Remediation Goals (PRGs) will be developed based on this approach and presented as a range of values along with the PRGs developed in the 2003 Baseline ERA to achieve a more complete understanding of the range of uncertainty associated with the data and provide important context for the risk managers.

2. Objective and Scope of MSU Studies

The KRSG grants to MSU supported the research of a team led by Dr. John Giesy (currently Professor emeritus at MSU, and Professor and Canada Research Chair at the University of Saskatchewan). With these grants, Dr. Giesy's team conducted numerous detailed field studies. For some receptors, multiple lines of evidence were evaluated to support a weight of evidence analysis and to reduce the uncertainties associated with each assessment endpoint. As described in the Peer Review Statement of Work to which this charge is attached (ARCADIS 2008), the Peer Review Panel has received a variety of materials associated with the MSU studies, including a summary of the results of the studies evaluating potential risk specific to exposed sediments in the former Trowbridge Impoundment, copies of publications generated as a result of these studies that have appeared in refereed scientific journals, and other relevant supporting information.

3. Charge to the Peer Review Panel

3.1 Summary of Charge to the Panel

The charge to the Peer Review Panel is to review the MSU studies with respect to their suitability for evaluating potential risks to terrestrial receptors exposed to PCBs in floodplain soils in the formerly impounded areas of the Kalamazoo River. A summary of the MSU studies and supporting information has been provided to assist the Panel in their understanding of the material to be reviewed. The Panel must also review the Baseline ERA (CDM 2003) for important supporting information and lines of evidence for future risk management decisions. The Baseline ERA (CDM 2003) provides context for the MSU studies, which were designed to provide additional lines of evidence for consideration in the final risk management decisions. However, the Baseline ERA (CDM 2003) is not subject to this peer review.

The primary objective of the peer review process is for the Panel to provide an independent, technical opinion regarding the extent to which the information in the MSU studies should be incorporated as independent lines of evidence, along with those presented in the Baseline ERA (CDM 2003), in a weight of evidence evaluation of ecological risks to terrestrial receptor species in formerly impounded areas and for subsequent risk management decisions. In reviewing the materials associated with the MSU studies, the Panel shall weigh the following general questions when addressing the specific questions presented in Section 3.2:

- 1) Are the methods employed in the MSU studies appropriate and consistent with the current state of the science and relevant guidance?
- 2) Have uncertainties associated with the MSU studies been clearly identified and discussed?

- 3) Do the data and analyses presented in the MSU studies constitute reasonable and appropriate lines of evidence to consider in the evaluation of risks to terrestrial receptors in future risk management decisions?
- 4) Do the MSU studies represent reasonable and appropriate lines of evidence for consideration in risk management decisions regarding the formerly impounded areas?

3.2 Specific Questions to be Addressed by the Panel

Each Panel member, consistent with his or her specific technical expertise, shall independently review each of the questions listed below and provide a thorough explanation of the response. Responses should be supported by citations or other background information, as appropriate. Answers to the primary questions should be supported by consideration of the supplemental issues. In evaluating each specific issue, the Panel members shall weigh the considerations described in the charge summary (Section 3.1).

Exposure Assessments

This section addresses specific issues regarding the evaluation and interpretation of levels of exposure to PCBs for receptors that use the floodplains of the formerly impounded areas. A summary of the types of data and strategies employed by MSU for the evaluation of exposure for the various receptor species is presented in Table 2 (included on the next page). Please address the following question regarding exposure and the supplemental issues.

Question 1. What are the relative strengths, limitations, and uncertainties associated with the methods employed by MSU to estimate the exposure of each receptor species to PCBs?

Supplemental Issues to Consider:

- 1a. Relative strength of various measures of exposure evaluated for each receptor when available individually and in combination. Examples of the types of data MSU considered include: a) literature based information on preferred prey; b) Site-specific data on receptor-specific prey items; c) site-specific bioaccumulation factor-based estimates of PCBs in prey; d) direct measures of PCBs in prey; and e) direct measures of PCBs in tissues/eggs of receptors.
- 1b. Effects of differing dietary preferences on extrapolating from the results of the MSU studies to other species. As an example, how may species-specific dietary preferences of the wrens or bluebirds evaluated in the MSU studies affect extrapolation of risk from these species to robins?

- 1c. The potential effects of future conditions, such as possible changes in habitat over time due to natural succession or anthropogenic changes to enhance recreational use. Some examples include lowered water table and reduced soil moisture content related to dam removal, transition to meadows including short grass habitat or succession to mature hardwood forest.

Table 2 Data Types Available for Refining PCB Exposure Estimates

Available Data	Proposed Use
Bird tissue data presented in Blankenship et al. 2005; Neigh et al. 2006b; Strause et al. 2007a, b, 2008; Zwiernik et al. 2007 and the summary of the MSU studies.	Develop estimate of avian body burden for use in dose model for upper trophic level species.
Shrew and other small mammal tissue data presented in CDM (2003), Blankenship et al. (2005), and the summary of the MSU studies.	Develop estimate of small mammal concentration for use in dose model for upper trophic level species.
Invertebrate tissue data presented in CDM (2003), Blankenship et al. (2005), and the summary of the MSU studies.	Develop estimate of invertebrate concentration for use in dose model for insectivores.
Egg concentrations from multiple avian species presented in CDM (2003), Neigh et al. 2006b, 2007; Strause et al. 2007a; Zwiernik et al. 2007 and the summary of MSU studies.	Compare to egg-based TRV.
Great horned owl pellet analysis and passerine nestling dietary composition analysis conducted as part of the MSU studies (Neigh et al. 2006a; Strause et al. 2008; Zwiernik et al. 2007).	Refine estimate of dietary composition for purpose of dose modeling.

Effects Assessment

This section addresses specific issues regarding the strategies employed in the MSU studies to evaluate potential effects of PCB exposure on receptors utilizing the floodplains of the formerly impounded areas. Please address the following questions regarding effects and the supplemental issues.

Question 2: What are the relative strengths, limitations, and uncertainties associated with the productivity assessments conducted by MSU on passerines and great horned owls (Neigh et al. 2006a, 2007; Strause et al. 2007a, 2008).

Supplemental Issues to Consider:

- 2a. Strengths and limitations of directly measuring productivity in the field compared to extrapolating from controlled laboratory studies.
- 2b. Extrapolation of results from field productivity studies to other species such as the American robin, which was the receptor species considered in the Baseline ERA (CDM 2003).
- 2c. Evaluation of potential causal factors (e.g. PCB concentrations, habitat differences, etc) associated with any difference in measures of productivity in passerines relative to the reference site.

Question 3: What are the relative strengths, limitations, and uncertainties associated with the hazard quotient calculations performed by MSU to evaluate potential risk to passerines, great horned owls, and shrews (Neigh et al. 2007; Strause et al. 2007a, 2008)?

Supplemental Issues to Consider:

- 3a. Choice of toxicity reference value (TRV), including relevance to receptor species and quality of study (e.g., duration, inclusion of sensitive life stages, exposure range, endpoints measured).
- 3b. Uncertainty resulting from extrapolating from laboratory study to field.
- 3c. Uncertainties in extrapolating from one species to another.

Applicability of the Investigations

This section addresses the overall quality of the data and the analyses presented in the MSU studies and their applicability for the evaluation of ecological risk and supporting risk management decisions for the floodplains of the formerly impounded areas. With this in mind please address the following questions.

Question 4: What are the relative strengths, limitations, and associated uncertainties that should be considered when evaluating the results of these studies as potential lines of evidence in future risk management decisions?

Supplemental Issues to Consider:

- 4a. Study designs including (but not limited to) sample size, replication, temporal duration, and aggregation of data.
- 4b. Data interpretation, including the choice and application of statistical methods.

- 4c. Approach for addressing natural variability.
- 4d. Identification and characterization of uncertainties.
- 4e. Adequacy of the data to support inferences on population-level effects.

Question 5: What are the relative strengths, limitations, and associated uncertainties that should be considered when extrapolating from the results of MSU studies conducted in the former Trowbridge Impoundment to the other formerly impounded areas of the Kalamazoo River?

Supplemental Issues to Consider:

- 5a. Numeric and spatial distributions of PCBs in floodplains of former impoundments.
- 5b. Habitat characteristics in floodplains of formerly impounded areas.
- 5c. Likely utilization of floodplains in formerly impounded area by the receptor species evaluated in MSU studies

Risk Management

This section addresses the potential usefulness of the MSU studies in supporting risk management decisions for the floodplains in the formerly impounded areas. It is possible that the results of the MSU studies would be incorporated as independent lines of evidence, along with data from the Baseline ERA (CDM 2003), in an Area-specific ecological risk assessment process. With this in mind please address the following question.

Question 6: Please comment on the applicability of the information presented in the MSU studies for informing risk management decisions.

4. References

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